DEVELOPMENT OF LOW COST MRP SOFTWARE FOR A MANUFACTURING PROCESS

Thesis submitted in accordance with the partial requirements of the Kolej Universiti Teknikal Kebangsaan Malaysia for the Bachelor of Manufacturing Engineering (Manufacturing Process)

By

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DEVELOPMENT OF LOW COST MRP SOFTWARE FOR A MANUFACTURING PROCESS

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ABSTRACT

MRP software is one of the approaches that had been considered important in improving the performance and competitiveness of manufacturing industry. The results of the research carried out companies that had used this software for implementation their organization such as Society Manufacturing Engineering Technology, Society Manufacturing Engineering Aerospace, TDK, and so on. Normally, MRP was used by big company. This new development of low cost MRP system based on Microsoft Excel will help a small and medium industry to control their inventory control. Its cause from the in expensive cost for MRP software in the market and the SMI can’t use it. However, this low cost MRP software based on Microsoft Excel will gives the chance SMI to use it. Regarding to this matter, the manufacturing industry will be increase the productivity follows the IT development which growing rapidly and fulfilling the manufacturing strategy criteria.
DEDICATION

For my beloved fiancé and family.
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<tbody>
<tr>
<td>APICS</td>
<td>The Association for Operation Management</td>
</tr>
<tr>
<td>APS</td>
<td>Advanced Planning and Scheduling</td>
</tr>
<tr>
<td>BOM</td>
<td>Bill of Material</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
</tr>
<tr>
<td>CMfgLT</td>
<td>Cumulative Manufacturing Lead Times</td>
</tr>
<tr>
<td>CMLT</td>
<td>Cumulative Material Lead Times</td>
</tr>
<tr>
<td>CRP</td>
<td>Capacity Requirement Planning</td>
</tr>
<tr>
<td>EOQ</td>
<td>Economic Order Quantity</td>
</tr>
<tr>
<td>FiC</td>
<td>Focus In Composite</td>
</tr>
<tr>
<td>FOQ</td>
<td>Fixed Order Quantity</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>JIT</td>
<td>Just in Time</td>
</tr>
<tr>
<td>MPS</td>
<td>Master Production Schedule</td>
</tr>
<tr>
<td>MRP</td>
<td>Material Requirement Planning</td>
</tr>
<tr>
<td>PDM</td>
<td>Product Data Management</td>
</tr>
<tr>
<td>PO</td>
<td>Purchase Order</td>
</tr>
<tr>
<td>PSM</td>
<td>Projek Sarjana Muda</td>
</tr>
<tr>
<td>QOH</td>
<td>Quantity on Hand</td>
</tr>
<tr>
<td>SMI</td>
<td>Small and Medium Industry</td>
</tr>
<tr>
<td>SME</td>
<td>Small and Medium Enterprise</td>
</tr>
<tr>
<td>SMET</td>
<td>Society of Manufacturing Engineering Technology</td>
</tr>
<tr>
<td>WIP</td>
<td>Work in Progress</td>
</tr>
<tr>
<td>WO</td>
<td>Work Order</td>
</tr>
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CHAPTER 1
INTRODUCTION

1.1 Project Introduction

This project is purposed to Development of Low Cost Material Requirement Planning (MRP) Software for a Manufacturing Industry. This project focuses on Material Requirement Planning (MRP). There are many software available in the market used for Manufacturing Industry such as MRP II software, MAS 90 software, Merlin MRP software Macola ERP software, Sage Pro Manufacturing software Navision Manufacturing software and so on. However, the market pricing for this software is quite high and only a big company can used this software. How about the Small and Medium Size Industry (SMI)? It’s they can afford to used this software? Therefore, the main purpose of this project is to develop a low cost MRP software, which it yet having all the main functions of MRP embedded within it.

1.2 Definition of MRP

Material Requirement Planning (MRP) is a computational technique that converts the master schedule for end products into a detailed schedule for the new raw materials and components used in the end products. There has been much written about the many different manufacturing planning and control philosophies that are used in manufacturing. It is known as “time-phased requirement planning”. It provides a precise
scheduling system, an efficient material control system, and a rescheduling mechanism for revising plans as changes occur. (Richard, 1982).

According to Joseph Orlicky (1975), a MRP system, narrowly defined, consists of a set of logically related procedures, decision rules, and records (alternatively, records may be viewed as inputs to the system) designed to translate a master production schedule into time-phases net requirements, and the planned coverage of such requirements, for each component inventory item needed to implement this schedule. It re-plans net requirements and coverage as a result of changes in either the master production schedule, or inventory status, or product composition.

MRP can be applied even by very small manufacturing companies to assure a smooth flow of product. At one times, each function of the process was handled by a separate software package and the packages might not be tightly integrated. It also geared to small manufacturers have been available since the early 80s. Many companies have adopted the approach of material requirements planning (MRP) and manufacturing resource planning (MRP II).

There have an example of the significance of MRP which gives the meaning and the important to develop the MRP software. The statements are given below;

George Plossl, one of the father of MRP, says so eloquently, “MRP calculates what I need, compares it to what I have, and calculates what I need to go get and when”.

1.3 Problem Statement

MRP has been known as an effective inventory management system. Many of the companies have recorded their successful in utilize the MRP systems. However, most of the existing MRP software is very expensive. Therefore, this low cost MRP software is developed purposely for Small and Medium industry companies. In a common
manufacturing company, a perfect stage would never or hardly be achieved, where there aren't any downtimes, wastage, scraps and other. Many companies have a difficulties and problem occur, especially in inventory controls. Without a proper way of managing the stock, company productivity would be affected. In this case, if they have MRP software, that problem can be reduced and also the productivity in their company will be increase.

Product delayed to the customers will make a problem in the future about the order and re-order part product from the companies. The lack of inventory management can't be trusted by the customers in the future. One times its give the problem, it will cost down to the product. It's mean the value of that product is lower and the companies get the impact from the profitable down rapidly.

1.4 Objective

The main project objectives of this project are;

1) To design and develop a low cost MRP software for a Manufacturing Industry.
2) To measures the efficiency of implementation of the MRP Software such as the performance on inventory control and management.

To develop a low cost MRP software needed to survey the application this system in the market and the focus of useable the system in the small companies. Basically, this MRP system based on the Microsoft Excel and needed to be used by the small companies' especially local companies. Beside that, the system must be follow-up and guided for getting the result. It's for analysis the efficiency of implementation MRP software.
1.5 Scope of Project

The scope of this project including each component of MRP such as Master Production Schedule (MPS), Bill of Material (BOM), Quantity on Hand (QOH), and Part Lead Times.
CHAPTER 2
LITERATURE REVIEWS

2.1 Introduction

Control problems have always been uneasy. Even the control and maintenance of inventory is a problem common to all organizations in any sector of the economy. For those manufacturing companies or firms especially, inventory control is a headache. Reordering stock, calculating requirements, producing goods and other unmentioned tasks have to be done periodically to maintain the efficiency of operation in company. That means control problems have always been uneasy. Even the control and maintenance of inventory is a problem common to all organizations in any sector of the economy.

2.2 What is MRP?

The original MRP dates back to the 1960s, when the letters stood for materials requirements planning (now called MRP One or MRP 1). MRP1 enables a company to calculate how many materials of particular types are required, and at what times they are required. To do this it uses a sales order book which records known future orders and also a forecast of what sales orders the business is reasonably confident might be won. MRP then checks all the ingredients or components which are required to make these future orders and ensures they are ordered in time.
MRP is a system that helps companies make *volume* and *timing* calculations similar to these but on a much larger scale, and with a greater degree of complexity. The volume means a capacity of a part product and the timing is a times process. Prior to the 1960s, companies did these types of calculations manually to ensure that they had the right materials available in their business at the right time. However, with the advent of computers and their more widespread use in business from the 1960s onwards, this provided the opportunity to perform these time-consuming, detailed calculations by computer quickly and relatively easily.

Material Requirement Planning (MRP) is the alternative that was developed in an effort to improve the situation in the companies. In MRP, rather than managing based on past usage, its look ahead to anticipate need and replenish according to future requirements. It does bring in supplies only when needed and only in the quantities necessary to meet the need. Its also a calculation technique that uses a master schedule, which is a build plan for the items that need to see, as a starting point. The master schedule is developed from a forecast of demands, backlog of orders with future ship dates, or a combination of these. Like MRP, Master Scheduling identifies expected shortages and plans the activities necessary to prevent the shortage. The master schedule is planned production (start date, due date, quantity) generally only at the sellable item level. Once the master schedule is developed, MRP is used to plan the acquisition of all of the assemblies, subassemblies, components, and materials necessary to meet the master schedule and all supporting production.

MRP calculates and maintains an optimum manufacturing plan based on master production schedules, sales forecasts, inventory status, open orders and bills of material. If properly implemented, it will reduce cash flow and increase profitability. MRP will provide you with the ability to be pro-active rather than re-active in the management of your inventory levels and material flow.

MRP will plan production so that the right materials are at the right place at the right time. MRP determines the latest possible time to product goods, buy materials and
add manufacturing value. Proper Material Requirements Planning can keep cash in the firm and still fulfill all production demands. It is the single most powerful tool in guiding inventory planning, purchase management and production control. MRP is easy to operate and adds dramatically to profits.

2.3 History of MRP

In the early 1960s, bill of material processor written on a 1400 disk computer in Milwaukee. In 1967 IBM helped bring to market the first management operating systems (MOS), including PICK. IBM continued to bring field developed programs to plan and manage inventory to the general market. By this time, the 360 model computer was on the scene and the first MRP (material requirement planning) systems continued to develop in functionality. By the early 1970 the word “material requirement planning” were in common use. In 1975 Joseph Orlicky from IBM wrote the classic work, MRP: The New Way of Life in Production and Inventory Management. This work documented the state-of-the-art at the time, including Dr. Orlicky’s own experience developing and implementing MRP systems as a Director of Production control for a major farm machinery manufacturer. (Carol, 2000)

2.4 Element of MRP

Material Requirement Planning (MRP) have many element depends on the requirement of the systems used. Basically, MRP system have four main element in the systems that is Master Production Schedule (MPS), Bill of Material (BOM), Quantity on Hand (QOH), and Part Lead Times. Normally, the element in the MRP systems was selected followed the categories used to companies based on the MRP software develop by a vendor. For an example, the element of MRP used for manufacturing industry, assemblies industry, textile industry, fabrication industry and so on. MRP uses the
following elements to plan optimal inventory levels, purchases, production schedules and more such as given below;

1) Master Production Schedule (MPS)
2) Bill of Material (BOM)
3) Quantity on Hand (QOH)
4) Capacity Requirement Planning (CRP)
5) Part Lead Times
6) Purchasing
7) Work Order
8) Inventory Control
9) Lot Sizing
10) Safety Stock Requirements

The basic element MRP software is Master Production Schedule (MPS), Bill of Material (BOM), Quantity On Hand (QOH) and Part Lead Times. In this development MRP software based on Microsoft Excel, it was contains four element which used for Small and Medium Industry (SMI) or known as Small and Medium Enterprise (SME).

### 2.4.1 Master Production Schedule (MPS)

The MPS is a line on the master schedule grid that reflects the anticipated build schedule for those items assigned to the master scheduler. The master scheduler maintains this schedule, and in turn, it becomes a set of planning numbers that drives material requirements planning. It represents what the company plans to produce expressed in specific configurations, quantities, and dates. The MPS is not a sales item forecast that represents a statement of demand. The MPS must take into account the forecast, the production plan, and other important considerations such as backlog, availability of material, availability of capacity, and management policies and goals.
MPS is defined as an anticipated build schedule for manufacturing end items or product options by quantity per planning period (called the time buckets). It represents what the company plans to produce expressed in specifics configurations, quantities, and dates. The authorization to produce the product must be translated into the MPS. The MPS is a listing of:

1) The end items (products) or major sub-assemblies (standard modules) that are to be produced.
2) The quantity of each item to be produced
3) When they are to be ready for shipment

MPS is the statement of production by item, date, and quantity for as far out as the planning system extends. These schedules are constrained by the strategic business and production plans and drive all detailed operating plans. MPS also takes into consideration capacity, material, and vendor limitations along with management decisions (policies and guidelines) to make sure that the schedules developed are valid and realistic. MPS is the disaggregated version of the production plan and must sum to it. (Khalid, 2001)

The MPS is a detailed plan that states how many end items will be produced within specified periods of time. Master scheduling is the bridge between the strategic plan expressed as the production plan (aggregate planning process) and the execution of that plan through detailed material and capacity plans. Its also can be define as the plan that a company has developed for production, inventory, staffing, etc. It sets the quantity of each end item to be completed in each week of a short-range planning horizon. A Master Production Schedule is the master of all schedules. It is a plan for future production of end items. MPS gives production, planning, purchasing, and top management the information needed to plan and control the manufacturing operation. The application ties overall business planning and forecasting to detail operations through the MPS. The MPS will drive detailed material and production requirements in the Material Requirements Planning module.